



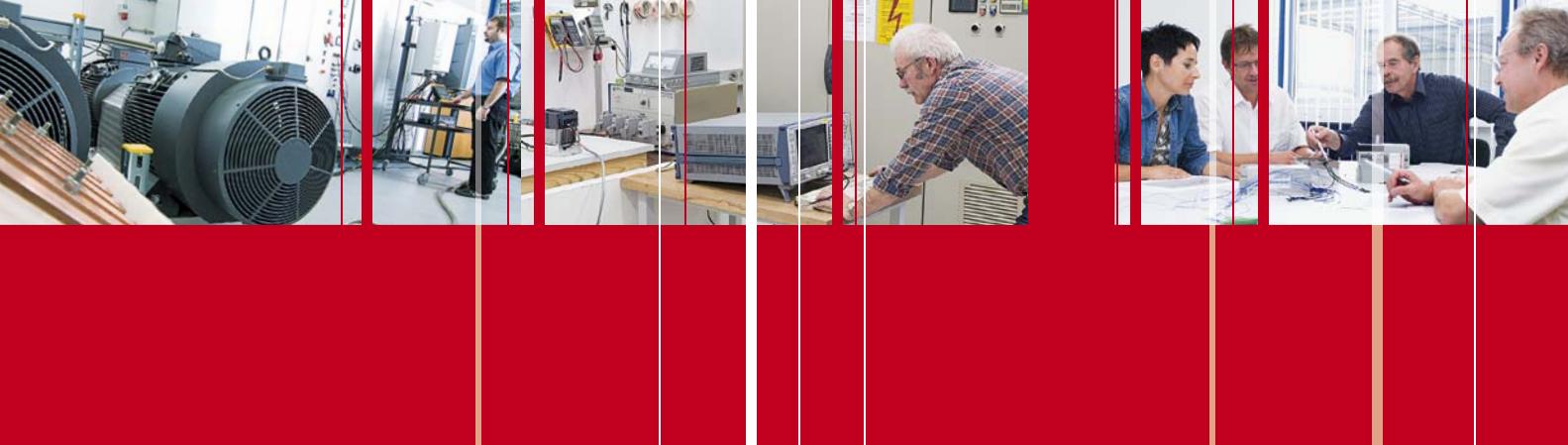
OCTOBER 2009

ECOsine™ Active

Harmonics compensation in real-time –
The compact, fast, and flexible solution
for better Power Quality

energy efficiency and reliability

SCHAFFNER



Schaffner GROUP

The Schaffner Group is the international leader in the development and production of solutions which ensure the efficient and reliable operation of electronic systems. The Group's broad range of products and services includes EMC/EMI components, harmonic filters and magnetic components as well as the development and implementation of customized solutions. Schaffner components are deployed in energy-efficient drive systems and electronic motor controls, in wind power and photovoltaic systems, rail technology, machine tools and robotics as well as power supplies for numerous electronic devices in sectors such as medical technology or telecommunications. Schaffner provides on-site service to customers around the world through an efficient, global organization and makes ongoing investments in research, development, production and sales to systematically expand its position as leader on the international market.

A global one-stop shop

EMC/EMI filters

- PCB filters
- IEC inlet filters / Power entry modules
- DC filters
- Single-phase filters
- Three-phase filters
- Three-phase + neutral line filters
- Open frame filters

EMC/EMI chokes

Feedthrough filters and capacitors

Automotive components

Customized solutions

Power Quality products

- Line reactors
- dv/dt reactors and filters
- Sine wave filters
- Harmonic filters
- Regen reactors and filters
- Transformers

Customized solutions

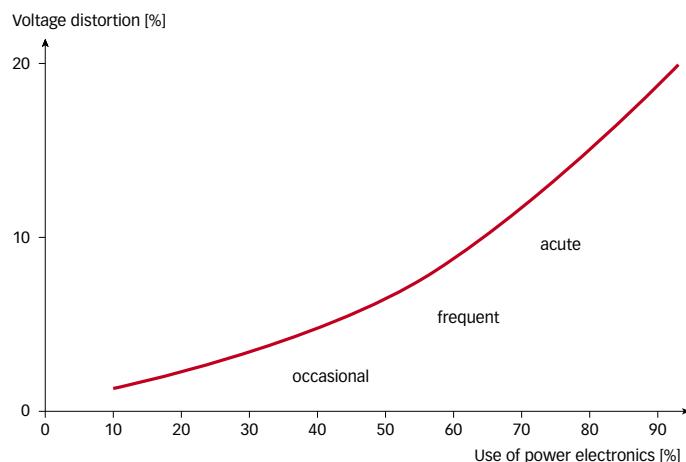
Consumers of electricity often suffer from poor power quality in their supply lines

Reliability and efficiency are assessed as being important to business operation. This includes reliable operation of machines, manufacturing systems, and office equipment. Nevertheless, this is frequently not the case and often there is no obvious reason, despite the use of UPSs and back-up generators.

- Distribution lines and networks cannot be fully utilized
- High percentage of energy losses in the power lines
- Increased wear and limited system availability
- Downtime for equipment and systems

Power quality problems in the internal power network are often the reason. Measurements and network analysis can detect the root cause of the problem.

ECOsine™ Active eliminates harmonics and reduces the cost for reactive power. Whether for machinery, welding equipment, variable-frequency drives, or electric motors: Almost all non-linear consumers nowadays can cause substantial voltage distortion.



A clear tendency worldwide: Voltage distortion increases along with the increasing use of power electronics

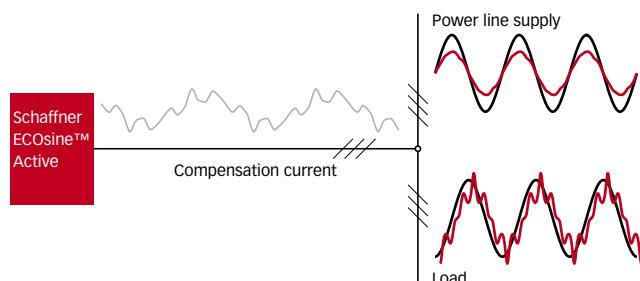
Harmonic currents up to the 50th harmonic and expensive reactive power: ECOsine™ Active eliminates both direct and reliable. This improves power quality and reduces cost.

Savings in reactive power can be easily calculated. However, cost reduction due to less wear on equipment, less troubleshooting, or even prevented production downtime are more difficult to quantify. Studies show that this amounts to billions in damages each year. ECOsine™ Active is thus a good investment for all areas with system perturbation problems.



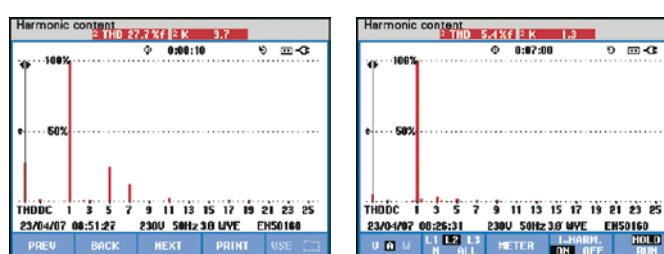
ECOsine™ Active – digital technology offers great benefits

As the latest generation of active harmonic filters ECOsine™ Active offers numerous additional advantages compared to traditional technology. Faster, smaller, and more performance. This makes power quality easier.



- **Ultra-fast:** ECOsine™ Active responds to disturbances in less than 300µs and eliminates them before they can cause damage.
- **Super-compact:** The smallest 30A filter is handy, small, and easy to install, and also the 300A cabinet unit provides the highest performance in the most compact package.
- **Optimized for maintenance:** Thanks to its design, the central modules in the 200 to 300A industrial models can be removed in less than 15 minutes (MTTR).
- **Suitable for industrial use:** With the IP54 protection class ECOsine™ Active is resistant to dust and other environmental influences.
- **Numerous options:** The ECOsine™ Active range covers specifications from 30 to 300A and 400 to 480V in either 3 or 4-wire technology.
- **Adaptive:** ECOsine™ Active compensates for individual disturbance patterns in a targeted manner and automatically adapts to changing network topologies.

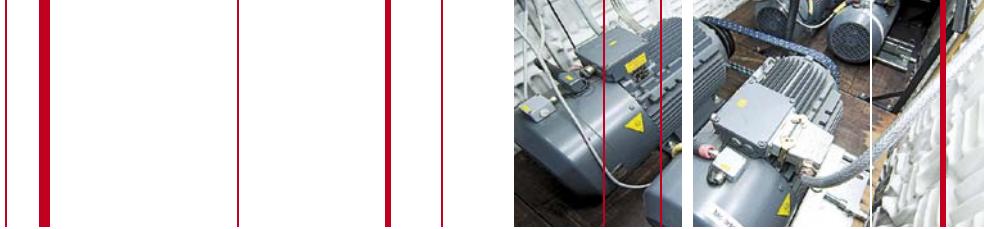
Harmonics caused by non-linear loads are reliably compensated for with ECOsine™ Active and the THD is reduced.



Without ECOsine™ Active:
Harmonics and reactive power stress the electrical installation and lead to problems

With ECOsine™ Active:
Reactive power and harmonics are actively compensated, thus ensuring better power quality





ECOsine™ Active 30/50A (3-wire) – The compact and easy-to-install filter.

The smallest ECOsine™ Active version is ideal for the reliable compensation up to the 50th harmonic, as well as reactive power, in a targeted manner. Thanks to its compact dimensions and low weight, this filter can be easily installed in any environment. For protection class requirements up to IP54 both wall and cabinet installation are possible. Not only space-saving, it is also economical in terms of power loss with only 1300W. With a response time of under 300µs in ultra-fast mode, it is also possible to optimally compensate dynamic loads.

This compact filter offers convincing technical features and an excellent mechanical design. A higher power level can be easily attained by paralleling up to 5 units.

ECOsine™ Active 30/60A (4-wire) – The solution for building technology.

This ECOsine™ Active version mitigates harmonics also on the neutral wire and is particularly qualified for the reliable compensation of 3rd and triple harmonics up to the 50th order. Low audible noise emissions make it the perfect solution for building technology, banking, data centers and hospitals.



ECOsine™ Active 100/120A – The standard for 3 and 4-wire technology is always the perfect fit.

Only slightly larger and heavier than their little brothers, the 100/120A unit can deal with twice the current. It is the perfect solution for those who need more performance right from the beginning and want to centrally connect it to their consumers.



ECOsine™ Active 200/250/300A – The industrial model is a real power pack.

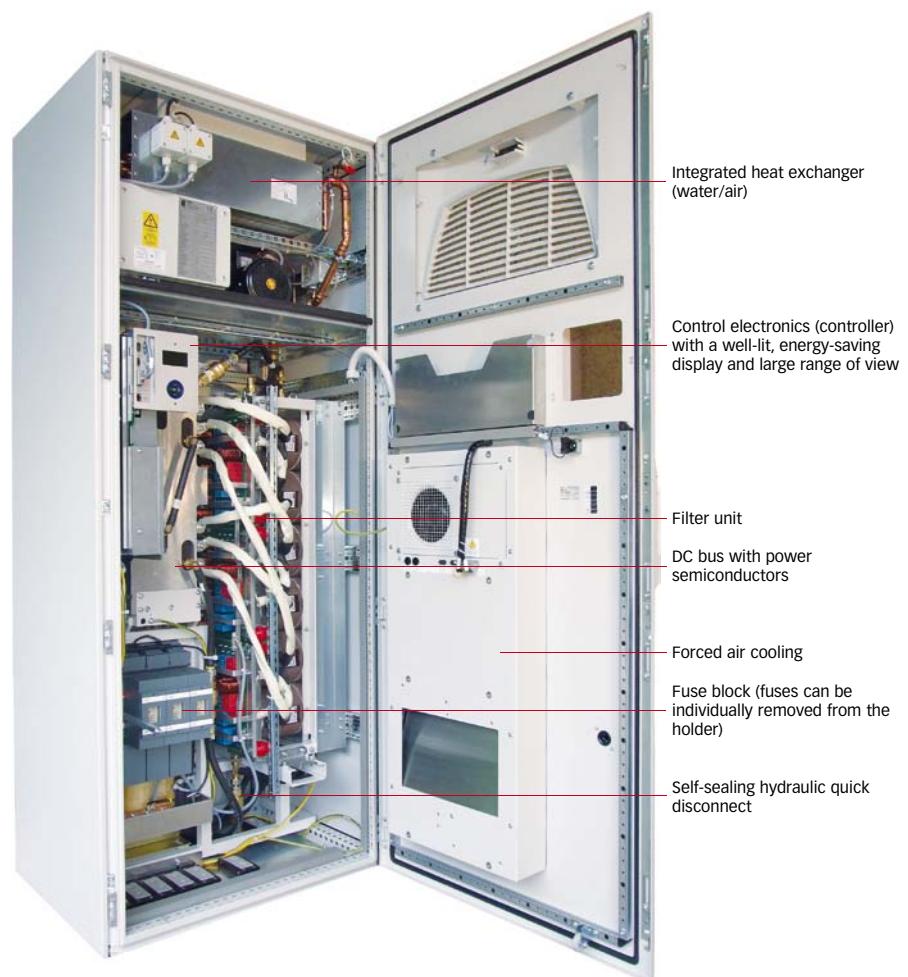
With up to 300A of compensating current, this filter remains fully capable for the highest requirements and for large production facilities, like those found in the automotive industry.

The cabinet version comes with forced air cooling, as well as internal liquid cooling for the power electronics with an integrated water/air heat exchanger. This is hi-tech in a compact package.



Minimal time-to-repair thanks to a modular design (MTTR <15 minutes). The ready-for-connection industrial cabinet unit with its modular design and IP54 protection class is especially advantageous and convenient. The individual modules can be easily accessed and removed from the front of the cabinet.

An MTTR value of less than 15 minutes with an MTBF value of up to 100,000 hours provides for the fastest service times and long maintenance intervals.



Control electronics are easy to remove.



Modules (filter unit and power element) can be released from the front with just a few bolt/plug connections.



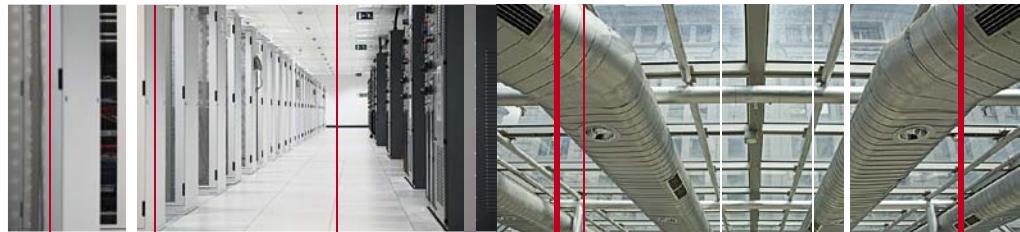
Liquid cooling can be disconnected quickly and without any spilling using quick-release couplings.



Modules can be popped out towards the front.

ECOsine™ Active offers an intelligent solution for many applications

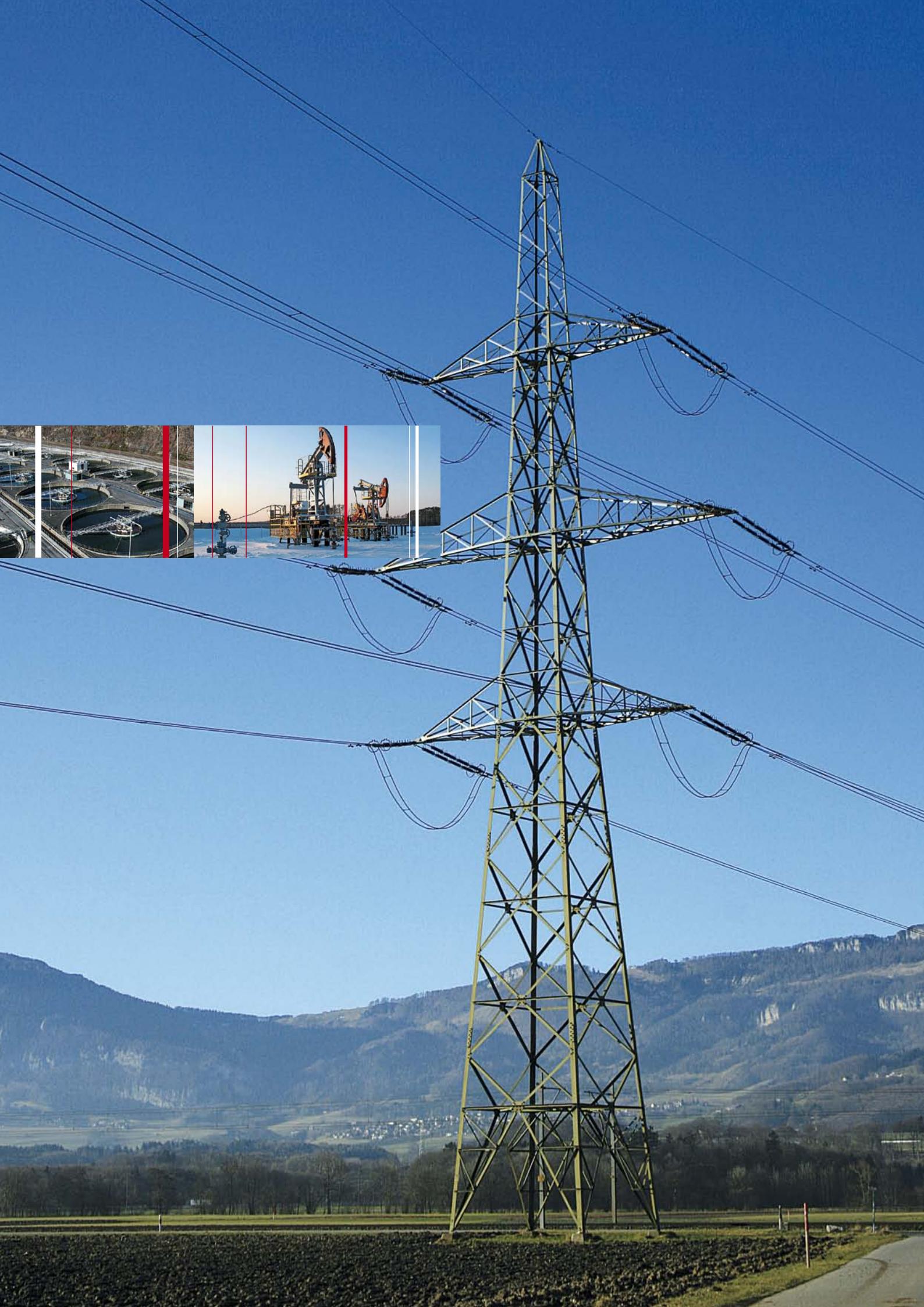
There is a wide range of companies and institutions that can clearly improve the power line quality of manufacturing systems or office facilities using ECOsine™ Active. On the one hand, this filter can be factored-in during the planning and implementation phase of new systems. On the other hand, ECOsine™ Active is also an intelligent solution for existing installations and facilities with power quality problems.



- | | | |
|--|--|---|
| <ul style="list-style-type: none"> ■ Automotive industry ■ Building automation ■ Cement industry ■ Data and banking centers ■ Elevators ■ HVAC installation ■ Machines and automation | <ul style="list-style-type: none"> ■ Oil and gas exploration ■ Paper mills ■ Ship propulsion ■ Steel industry ■ Tunnel ventilation ■ Uninterruptible power supplies (UPSs) | <ul style="list-style-type: none"> ■ Variable-frequency drives ■ Water/wastewater treatment ■ Welding equipment ■ Wind turbines |
|--|--|---|

ECOsine™ Active – the best harmonic filter money can buy. Most countries already have strict standards and limits for harmonic injection. Companies and facilities that consume energy are forced to monitor their internal power lines and ensure compliance with these limits. In critical cases, the energy provider may cut the power. Using ECOsine™ Active, detected deviations can be reduced and brought back into the tolerance range again. This provides much confidence.

The following standards specify limits for harmonics in networks/units:
EN 61000-2-2, EN 61000-2-4, EN 61000-3-2, EN 61000-3-12, EN 61000-3-3 as well as EN 50160, TOR D2, IEEE 519-1992, and D.A.CH.CZ.
ECOsine™ Active is the easiest way to comply with these standards and limits.



Technical specifications

FN 3420...	3-wire	.. -30-480-3	.. -50-480-3	—	.. -100-480-3	.. -120-480-3	.. -200-480-3	.. -250-480-3	.. -300-480-3
FN 3430...	4-wire	.. -30-400-4	—	.. -60-400-4	.. -100-400-4	.. -120-400-4	.. -200-400-4	.. -250-400-4	.. -300-400-4
Rated comp. current	3-wire 4-wire	30A 30/90A	50A —	— 60/180A	100A 100/300A	120A 120/360A	200A 200/600A	250A 250/750A	300A 300/750A
Switching frequency									16kHz
Overload capability ¹	75A for 10ms	125A for 10ms	150A for 10ms	250A for 10ms	250A for 10ms	500A for 10ms	625A for 10ms	750A for 10ms	
Cooling type				Forced air cooling					Forced air cooling (internal liquid cooling)
Ambient temperature		40°C ³	30°C ³	40°C ³	30°C ^{2,3}				40°C ³
Parallel operation					Up to 5 units				
Interfaces					Modbus RTU (RS485), Modbus TCP/IP (Ethernet)				
Power loss	3-wire	< 900W	< 1300W	—	< 2200W	< 2500W	< 5000W	< 6000W	< 7500W
	4-wire	< 950W	—	< 1800W	< 3000W	< 3000W	< 5500W	< 6300W	< 8500W
Cooling air requirement, speed-control- led fan	3-wire	< 350m³/h	< 550m³/h	—	< 1400m³/h	< 1400m³/h	< 2600m³/h	< 3100m³/h	< 3400m³/h
	4-wire	< 400m³/h	—	< 600m³/h	< 1700m³/h	< 1700m³/h	< 2800m³/h	< 3300m³/h	< 3600m³/h
Noise level (1m)	3-wire	65dBA	65dBA	—	68dBA	68dBA	70dBA	70dBA	70dBA
	4-wire	63dBA	—	63dBA	69dBA	69dBA	70dBA	70dBA	70dBA
Filter performance					Up to the 50th order				
Altitude					1,000m / derating up to 4,000m, 1% / 100m				
Mains voltage ⁴	3-wire			380V (AC) ±15% ... 480V (AC) ±10%		50Hz: 380V (AC) ±15% ... 415V (AC) ±10%			
	4-wire			380V (AC) ±15% ... 415V (AC) ±10%		60Hz: 480V (AC) ±10%	50Hz: 380V (AC) ±15% ... 415V (AC) ±10%		
Mains frequency				47 to 63Hz			50Hz or 60Hz ±5%		
Response time					300µs				
Controller topology					Digital with FFT analysis				
Current limitation					Nominal current				
Current transformer					100:5 to 50,000:5				
Dimensions (w x h x d) [mm]	3-wire	360x590x290	360x590x290	—	468x970x412	468x970x412			800x2000x600
	4-wire	415x840x300	—	415x840x300	468x1460x412	468x1460x412			Height plus socket (200mm standard), depth including heat exchanger 760mm
Weight	3-wire	47kg	47kg	—	105kg	105kg	415kg	415kg	415kg
	4-wire	70kg	—	70kg	145kg	145kg	495kg	495kg	495kg
Protection class				Standard IP20, optional IP54					IP54
Approval				CE, UL ⁵	—				CE, UL ^{5,6}

1 Peak value

3 Derating up to 55°C, 2%/K

2 Derating up to 40°C, 1.2%/K

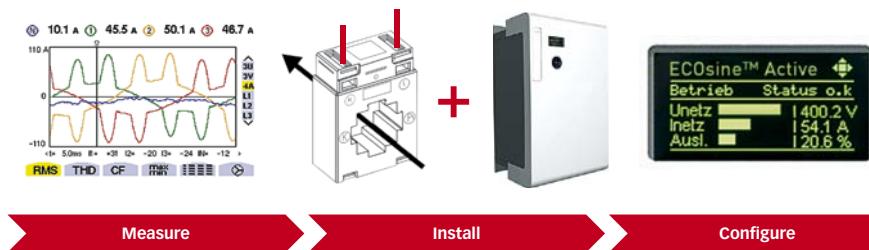
4 Other voltage on request

5 UL only for 3-wire types

6 Available as non-UL (FN 3420-xxx-480-3) and as UL-listed version (FN 3420-xxx-480-3-UL)

ECOsine™ Active uses intelligent digital technology. Its flexibility is obvious, as it can be connected to the power line on the load or grid side with numerous current transformer-ratios. Once configured with just a few clicks, the present line current will be permanently measured and all harmonics and phase displacements actively compensated. To do this, ECOsine™ Active calculates the appropriate compensation currents within microseconds, which are then generated and fed into the network. Fully digital control and fast, high-performance computing makes it possible.

Plug-and-play: 3 simple steps to better power quality



More details can be found in the
ECOsine™ Active user manual
(available upon request).

AHF Viewer supports monitoring on a PC

Commissioning, as well as the selection and setting of individual parameters, are very user-friendly in all ECOsine™ Active versions thanks to a multi-language, menu-based control panel and display. These steps can also be conveniently performed via a PC-connection using the AHF Viewer software-package. The current network status can optionally be retrieved online and adjustments made in remote operation either via RS485 or Ethernet TCP/IP.

Your partner for individual power quality. The Schaffner worldwide customer support network is available to assist you in finding the most suitable solution for optimum power quality in your installation and facilities: Throughout all phases from consultation to network analysis and planning, right up to implementation and after sales support.

ECOsine™ Active provides:

- **Reliability:** Eliminates all relevant disturbance patterns in the power lines
- **Cost-savings:** Avoids/reduces wear on electrical loads and over-heating of cables and transformers
- **Efficiency:** Prevents losses due to production downtimes
- **Flexibility:** Constantly adapts to the network topology
- **Fast response time:** Compensates disturbances before they can cause damage
- **Economy:** Lowers energy cost through reduced reactive power demand
- **Compact dimensions:** Requires very little space compared to traditional solutions
- **Ruggedness:** Provides protection according to IP54
- **Plug-and-play:** Simple installation and intuitive operation



energy efficiency and reliability

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